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An overview of the demographics, diagnoses, and analysis of patients transported by ambulance to the emergency department

ED ambulance transports: Demographics & diagnoses

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Abstract

Aim: This study aims to analyze the demographic characteristics of patients transported by ambulance to the emergency department (ED), their preliminary diagnoses during the pre-hospital phase, and their initial diagnoses and hospital outcomes after evaluation in the hospital.

Material and Methods: This was a prospective, cross-sectional descriptive study. Data were obtained from the emergency medicine physician's patient forms in the hospital information system. The analysis included patients' demographic characteristics, admission times, and status at the ED.

Results: A total of 633 patients who met the inclusion criteria were examined in this study. The demographic breakdown included 56.5% male (n=358) and 43.5% female patients (n=275), with ages ranging from 1 to 110 years and a mean age of 53.10 ± 24.59 years. Approximately one-third of the cases were geriatric patients. Nearly half of the patient admissions to the ED occurred between 16:00 and 24:00. Trauma was the predominant reason for ambulance transports, with most cases originating from the patients' homes. The majority were discharged as outpatients from the ED. Despite geriatric patients constituting a significant portion of ambulance transports, their admissions to the ED were evenly distributed throughout the 24-hour cycle. Ambulances were primarily used for trauma and neurological disorders. Admissions after midnight were significantly lower than those before midnight. Although diagnostic concordance between ambulance and ED was generally high, it was lowest among the elderly (over 85 years of age). Additionally, the level of diagnostic agreement was consistent across different EMS teams, regardless of whether they were physicians, paramedics, or EMTs.

Discussion: Pre-hospital diagnoses made by EMS personnel may be less accurate for older patients.

Keywords
Ambulance, Emergency Department, Prehospital, Outcome

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This study was approved by the Ethics Committee of Kartal Dr. Lütfi Kırdar City Hospital (Date: 2014-11-11, No: 3)

Introduction

The rising life expectancy today underscores the importance of high-quality healthcare services. In this context, advancements in emergency health services are particularly beneficial. Emergency departments (EDs), known for their rapid and effective interventions, alongside ambulances equipped to provide emergency health services, bear significant responsibility. A pivotal element in swift response is the role of tertiary EDs, which manage complex cases, relying extensively on ambulances for patient transport.

According to the American College of Emergency Physicians, individuals who identify themselves as "emergency patients" and seek care in the ED should be classified as emergency cases [1]. The transportation of ill and injured persons is a critical component of emergency and first aid care, with the initial contact, diagnosis, and intervention being essential parts of the pre-hospital process. In terms of emergency medical services (EMS), Turkey follows the Anglo-American model, where ambulances, staffed with professional teams and equipped for emergencies, are dispatched by Command and Control Centers upon receiving a call (112). These teams are prepared to provide both basic and advanced life support to individuals outside of hospital settings in emergencies. Ambulances serve as a cornerstone of the healthcare system, staffed by paramedics, doctors, and emergency medical technicians (EMTs). However, ambulance drivers are not always healthcare professionals; their duties include patient and equipment transport, offering preliminary treatment for infectious diseases, and supporting emergency patient transport. Beyond their primary role in emergency medical care, these activities are crucial for disaster response efforts [2-4].

Ambulances are vehicles specifically designed and equipped with the necessary technical and medical equipment for emergency assistance and patient transportation. The pre-hospital ambulance service (112) plays a crucial role in transferring emergency patients—who are impaired or at risk of impairment—to hospitals, while monitoring vital signs and providing necessary interventions en route. Beyond emergency department (ED) treatment, pre-hospital health services ensure patients receive quality care before reaching the hospital. The demand for prehospital healthcare services is increasing daily [5, 6], placing a strain on available resources when utilized for non-emergency purposes. Factors influencing ambulance service usage rates may include socioeconomic status, age, and illness severity. EDs and prehospital services collaborate to deliver medical services under challenging conditions [7, 8]. The objective for clinicians working in EDs is to provide high-quality service and enhance the quality of life for both themselves and their patients in this demanding and complex environment [9]. Achieving this level of quality requires seamless integration of diagnosis and treatment.

This study aims to evaluate the effectiveness of the prehospital system and to ascertain the demographic, clinical, and hospital outcomes of patients transported by ambulance to the ED of a tertiary hospital.

Material and Methods

In this prospective cross-sectional study, 633 patients brought by ambulance to our ED between November 1, 2014, and November 30, 2014, were examined. The hospital features three distinct EDs: one for adults, one for pediatrics, and one for gynecology. The adult ED treats trauma patients and those older than 13 years, with a dedicated trauma area for patients of all ages.

The emergency medicine physician who first encountered the patients recorded and managed their information. Ambulance healthcare professionals made preliminary diagnoses and noted the patients' pickup locations. This study included adult patients aged 18 and above, encompassing trauma cases, who were transported to the adult ED by ambulance. Parameters such as age, gender, and admission time were analyzed, along with the agreement between 112 health workers and ED staff on preliminary diagnoses and discharge statuses. Patients were divided into six age groups: 0-13, 14-25, 26-45, 46-65, and over 65 years old. The day was segmented into three intervals: 00:00-08:00, 08:00-16:00, and 16:00-24:00.

Patient origin locations were categorized as home, street, nursing home, other healthcare facility, and other. The outcomes for patients presenting to the ED were classified as discharge, ICU admission, ward hospitalization, treatment refusal-unauthorized abandonment, and death. Predicted diagnoses by ambulance and ED staff were organized by system. Exclusions from the study were patients with incomplete or inadequate records and those directed to pediatric and gynecological EDs.

Statistical analysis

Statistical analysis of the data collected from study participants was conducted using SPSS software for Windows (Version 29, Chicago, IL, USA). Descriptive statistics, including mean, standard deviation (SD), median, minimum and maximum values, frequency, and ratio, were employed to summarize the data. The distribution of the variables was assessed using point biserial correlation analysis. Logistic regression analysis was utilized for examining the dependent quantitative variables. Additionally, Pearson correlation analysis was applied to investigate the relationships between variables.

Ethical Approval

This study was approved by the Ethics Committee of Kartal Dr. Lütfi Kırdar City Hospital (Date: 2014-11-11, No: 3).

Results

Between November 1 and 30, 2014, a comprehensive analysis of 633 patients transported by ambulance to our ED was conducted. The demographic breakdown revealed a majority of male patients (56.5%, n=358) with a wide age range from 1 to 110 years, averaging at 53.10 years. The detailed distribution of preliminary diagnoses, highlighting trauma and neurological conditions as the most common, is summarized in Table 1. Transport origins showed a significant proportion of patients arriving from homes (54.2%, n=343), particularly older females, indicating a potential pattern in emergency calls and responses, as further elucidated in Table 1. Analysis of arrival times revealed a higher incidence of admissions during the latter half of the day (16:00-24:00, 42.8%, n=271), though no significant time-dependent variation in trauma rates was observed. The outcomes of these admissions, ranging from discharge to ICU admissions and deaths, are detailed in Table 2. Special attention was given to the elderly and advanced age groups, uncovering notable differences in gender distribution and diagnostic agreement rates between hospital and ambulance services for those over 65, as shown in Table 3. The composition of ambulance teams and their agreement with hospital diagnoses were also analyzed, showing no significant difference in diagnostic concordance across physician, EMT, and paramedic-led teams.

Table 1. Distribution of preliminary diagnoses made by ambulance and ED

	Preliminary Diagnosis			
	Ambulance		ED	
	N	%	N	%
Trauma	238	37.6	242	38.2
Neurologic	83	13.1	100	15.8
Respiratory	62	9.8	48	7.6
Cardiovascular	45	7.1	41	6.5
Gastrointestinal	43	6.8	44	7.0
Intoxication	28	4.4	28	4.4
Infectious	23	3.6	38	6.0
Metabolic	22	3.5	19	3.0
Genitourinary	17	2.7	27	4.3
Psychiatric	10	1.6	7	1.1
Obstetric or Gynecological	3	0.5	5	0.8
Unspecified	16	2.5	-	-
Other	43	6.8	34	5.4

Table 2. Outcomes of the patients

	n	%
Discharged	422	66.7
Intensive Care Unit admission	48	7,6
Unauthorized abandonment	16	2.5
Deceased	12	1.9
Hospitalized	135	21.3
Internal Medicine	38	6.0
General Surgery	20	3.3
Orthopedics	20	3.3
Neurology	11	1.7
Cardiology	8	1.3
Neurosurgery	7	1.1
Thoracic Surgery	6	0.9
Pulmonary Diseases	6	0.9
Plastic and Reconstructive Surgery	5	0.6
Cardiovascular Surgery	4	0.6
Ophtalmology	3	0.5
Psychiatry	3	0.5
Infectious Diseases	1	0.2
Obstetrics and Gynecology	1	0.2
Urology	1	0.2
Otolaryngology	1	0.2

Discussion

In this study, we analyzed data from patients transported by ambulance to the ED of a tertiary education and research hospital. The data collected indicate that a majority of these cases involve male patients. The predominant patient demographics include the elderly and those suffering from trauma. A comparison between ambulance diagnoses and hospital diagnoses revealed that patients younger than 85 years exhibit higher concordance rates in diagnoses than those older than 85 years.

Nearly half of the cases belong to the geriatric age group, with a significant proportion (25%) being patients over the age of 85. Similar studies have identified a comparably high prevalence of elderly individuals [10-12]. Despite overall higher ambulance utilization rates among men, women over the age of 65 were more likely to use ambulance services. When comparing groups aged over 65 with those between 65-85 years and those aged over 85, the rate of ambulance use among women in the advanced age group was statistically higher than that among men. The ambulance utilization rates observed in this study are consistent with those reported in the literature [13]. Our data on trauma cases revealed a significantly higher male-to-female ratio. A study by Akoğlu et al. at Marmara University Hospital's ED, located in proximity to our study site, reported a high percentage of male patients among trauma admissions [14].

This study revealed that prediagnosis agreement rates were significantly higher in patients who had experienced trauma compared to those who had not, upon comparing hospital and ambulance prediagnosis agreements. Further analysis of prediagnosis agreement rates between the age groups of 65–85 years and those over 85 years indicated that the agreement rate was significantly higher in the 65-85 year-old group.

We also discovered that ambulance admissions were statistically significantly lower between 24:00 and 8:00 hours compared to other times of the day. The majority of ambulance admissions occurred between 16:00 and 24:00; however, no significant difference was observed between the time intervals of 08:00-16:00 and 16:00-24:00. This finding aligns with the study conducted by Kıdak et al., which reported the highest number of emergency calls during evening hours and the lowest after midnight. Similarly, a study by Yaylacı et al., conducted in the same city, found no significant differences in ambulance admissions between on-hours and off-hours [15]. Even in a bustling city like Istanbul, where activity spans throughout the day, admissions dwindle after midnight, likely because the majority of people are asleep. The lack of distinction between working and non-working hours in Yaylacı's study may be attributed to private health insurance coverage for ambulance-admitted patients. In our study, the majority of ambulance admissions originated from patients' homes. Conversely, a study by Önge conducted in an Emergency Department in Adana, another city, found that most patients were transported from home by ambulance [16].

In our study, trauma patients comprised the majority of those transported by ambulance to the Emergency Department (ED), with diseases of the neurological and respiratory systems ranking second and third, respectively. This finding contrasts with Zenginol et al., who reported trauma, cardiovascular

Table 3. Comparison of Elderly and Advanced Age Groups

≥65 (n=251)		65-85 (age) (n=191) n (%)	≥85 (age) (n=60) n (%)	P
Sex	Male	99 (51.8)	18 (30.0)	[a]0.003**
	Female	92 (48.2)	42 (70.0)	
Admission Hour	00.00-08.00	31 (16.2)	9 (15.0)	[a]0.939
	08.00-16.00	81 (42.4)	27 (45.0)	
	16.00-24.00	79 (41.4)	24 (40.0)	
Hospital Pre-diagnoses	Trauma	30 (15.7)	9 (15.0)	[b]0.681
	Cardiovascular	24 (12.6)	7 (11.7)	
	Respiratory	27 (14.1)	7 (11.7)	
	Neurologic	39 (20.4)	7 (11.7)	
	Metabolic	10 (5.2)	2 (3.3)	
	Gastrointestinal	15 (7.9)	9 (15)	
	Intoxication	3 (1.6)	1 (1.7)	
	Infectious	18 (9.4)	6 (10.0)	
	Genitourinary	13 (6.8)	8 (13.3)	
	Psychiatric	2 (1.0)	0 (0)	
	Obstetric or Gynecological	1 (0.5)	0 (0)	
	Other	9 (4.7)	4 (6.7)	
Hospital and ambulance agreement	Agreement exists	133 (69.6)	33 (55.0)	[a]0.037*
	No agreement	58 (30.4)	27 (45.0)	
Outcome	Discharged	96 (50.3)	29 (48.3)	[b]0.950
	Hospitalized	54 (28.3)	20 (33.3)	
	Intensive Care Unit admission	30 (15.7)	8 (13.3)	
	Unauthorized abandonment	3 (1.6)	1 (1.7)	
	Deceased	8 (4.2)	2 (3.3)	

aPearson Chi-Square Test, bFisher Freeman Halton Test, *p<0.05,**p<0.01

disease, and neurological disease as the most common reasons for ambulance transport [11]. Similarly, Oktay et al. identified trauma, cardiovascular disease, and neurologic disorders as the primary preliminary diagnoses [17]. The absence of a cardiology service at our hospital, coupled with our proximity to a specialized cardiology branch hospital, likely explains the reduced number of cardiovascular patients arriving by ambulance.

Our hospital is equipped with trauma-related specialities available 24 hours a day, enabling immediate, comprehensive surgical and multidisciplinary treatment of trauma cases. This capability underlies the high incidence of trauma admissions observed. Approximately two-thirds of trauma patients were discharged following outpatient interventions. Those requiring hospitalization were predominantly admitted to the orthopedics and general surgery wards, with trauma-related discharges representing a significantly larger fraction of total discharges. Interestingly, cases necessitating ICU hospitalization and those resulting in death exhibited a lower level of trauma severity. Despite a high percentage (79.1%) of geriatric patients requiring ICU hospitalization, no significant age-related differences were observed between the 65-85 and over-85 age groups. Furthermore, the majority of hospitalized patients who succumbed to their conditions were over the age of 65.

The study demonstrated that there was a significant concordance between the preliminary diagnoses made by ambulance paramedics and the final diagnoses confirmed by the hospital. This correlation was consistent regardless of whether the ambulance team was composed of doctors, paramedics, or Emergency Medical Technicians (EMTs).

Limitation

This study, while providing valuable insights into the concordance of preliminary diagnoses and the demographics of ambulance admissions, is not without its limitations. The reliance on ambulance-based data may not fully capture the spectrum of emergencies presented to the ED, particularly given the absence of a cardiology service at the hospital which potentially skews the type of cases being transported by ambulance. Furthermore, the findings regarding the impact of age on preliminary diagnosis accuracy and the non-uniform distribution of admission times suggest that these factors might influence the study's outcomes. Additionally, the generalizability of these results may be limited by the study's setting in a specific hospital and its proximity to specialized facilities, which might not reflect the broader emergency care context. Future research could benefit from a more comprehensive approach that includes a wider range of emergency services and accounts for the variations in healthcare delivery systems across different regions.

Conclusion

The analysis revealed that age may serve as a confounding factor in the accuracy of preliminary diagnoses made by clinicians during the prehospital phase for patients admitted to the ED via ambulance. Despite a predominant number of admissions being trauma-related, the distribution of admission times was found to be non-uniform.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content *including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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